Batch Microwave+Convection Heat Treatment for Drying of Silicon Carbide Block

MEMBER OF A.M.P.E.R.E (EUROPE)
MEMBER OF AIMCAL (USA)

IN ASSOCIATION WITH EMitech, ITALY

A CRISIL-NSIC RATED COMPANY
ISO-9001-2008 COMPANY

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

Customer :	**M/s. Grindwell Norton Ltd, Gujrat**
Process :	**Batch Microwave+Convection Heat Treatment for Drying of Silicon Carbide Block**

TEST REPORT No: 47/KRDC/LAB/17 Mum 05/09/2020

Date Sample reception : 05/09/2020
ID : 47/LAB/172

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 8 Nos
Sampling date : 06/09/2020
Product : Silicon Carbide Blocks
Requirement : Final moisture content should be 0.1%
Start Date test : 06/09/2020
End Date test : 10/09/2020

LABORATORY EXPERIMENTAL SET UP:

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 kW(CW)
Frequency	2450 MHz ± 50
Convective Power	3.5 kW (air flow 350 l/min at 20°C)
Microwave Exposure Zone (cavity)	1 cubic meter
Mode Stirrer	One
Thermal Monitoring System	Single Channel Fiber Optic: Range -40 to 250°C
Exhaust Power	1HP
Tray Size	450x950x50 mm

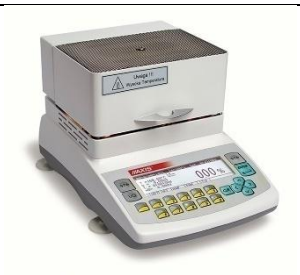
ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	31°C (±5°C)
Humidity (%)	≤83% RH
Pressure (kN/m2 or kPa)	Not recorded

Note for recommendation: Environmental conditions have a direct impact on test results. Accuracy and consistency of test data are affected by the laboratory conditions

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120 IR Thermal sensitivity of 0.10°C
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)
Thermo Hygrometer		Model No: HTC-2 Temperature accuracy: ±°C (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: ±5% RH Humidity resolution: 1% RH

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given sample of Silica Carbide Block to speed up the heating rate for drying treatment. For this experimental run, given sample has been placed in batch microwave+convection hybrid heating system for different setting parameters to achieve required drying rate. The observations are made on the basis of temperature on product, total weight loss and any damage to product samples.

Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

ANALYTICAL RESULTS:

	Trial No.1	Trial No.2	Trial No.3	Trial No.4
MW Power (kW)	1.6	1.6	1.8	1.8
Hot Air Temperature(°C)	160	160	160	160
Cycle Time(hours)	8	6	6	8
No. of Blocks	1	1	1	2
Initial Weight (kg)	40.70	40.90	40.65	a)40.65 b)40.55
Final Weight(kg)	40.05	40	39.70	a)39.80 b)39.75
Temperature on Product(°C)	118-122	120-125	135-140	105-115
Cracks Formation	No cracks	No cracks	No cracks	No cracks
Remarks, if any	No weight loss after 5 hours	-	No weight loss after 5 hours	No weight loss after 6 hours

THERMAL IMAGE BEFORE AND AFTER HEAT TRAETMENT:

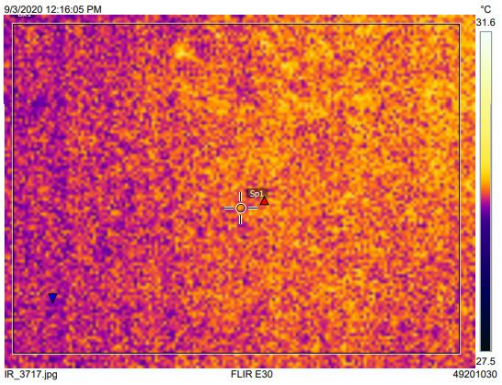
1. **Before Heat Treatment:**

Measurements

Bx1	Max	30.2 °C
	Min	29.1 °C
	Average	29.5 °C
Sp1		29.7 °C

Parameters

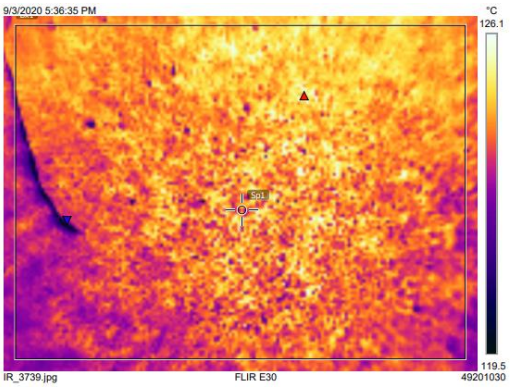
Emissivity	0.95
Refl. temp.	20 °C



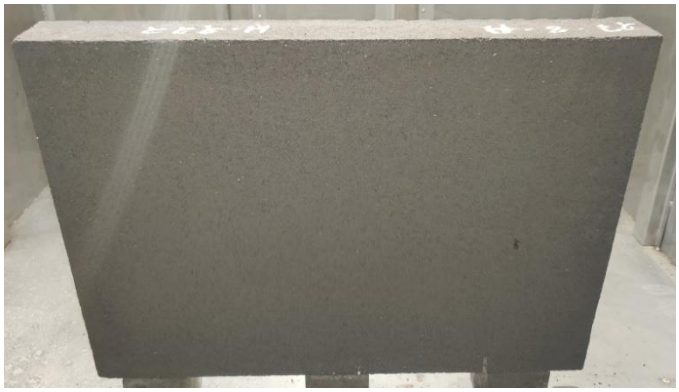
Kerone Research & Development Centre (KRDC)
B/47,Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

2. After Heat Treatment:

Measurements		
Bx1	Max	127.1 °C
	Min	119.5 °C
	Average	123.3 °C
Sp1		121.8 °C
Parameters		
Emissivity		0.95
Refl. temp.		20 °C



BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:



BEFORE

AFTER

OBSRVATIONS:

The drying behavior of Silicon Carbide blocks has been investigated under the Microwave+Convection Heating System. The drying rate is found to be increasing with respect to increasing drying time. It has been found that the moisture content on the dry basis (%) decreases with respect to increase in drying time. As per physical investigation, it has been observed that there is no crack formation in any sample with required product temperature.

KKomal

Miss. Komal Bhoite
Tested By